CAM-BOLT ASSEMBLY

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 60/423,117, filed on November 1, 2002. The disclosure of the above application is incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to a cam bolt for a vehicle suspension and, more particularly, to a cam bolt having a locking feature which efficiently couples a cam plate to a bolt without significantly reducing the bolt's effective strength.

BACKGROUND OF THE INVENTION

[0003] It has been known that plates can be coupled to shafts utilizing a single notch cut into the bolt surface. Traditionally, the plate has a D-shaped hole with a cross-section which corresponds to the cross-section of the notch disposed in the bolt is placed over the bolt and held using a threaded fastener.

[0004] Often, the plates are subject to torsional loading, which imparts torsional loading to the bolt. Often, designs require that these bolts have a particular torsional strength to ensure that the flange does not become dislodged from the bolt when loaded. In order to maintain the relative position of the plate with respect to the bolt during the torsional loading, the interaction of the plate

with the bolt must be such that plastic deformation of the interface does not occur. For this condition to occur, large portions of the bolt surface have been removed to allow for proper interlocking of the members.

[0005] The notched bolt, because of its reduced cross-sectional area, has significantly reduced strength. As such, to maintain load requirements, the diameter of the bolt is typically significantly increased to compensate for the weakness in the threaded portion of the fastener. This increases cost and weight of the assembly.

SUMMARY OF THE INVENTION

[0006] A cam bolt assembly for using in a vehicle's suspension system to adjust the vehicle's wheel alignment is disclosed having a threaded fastener defining a pair of longitudinal channels, a first cam plate is coupled to the threaded bolt, a second cam plate defining an aperture is mated to the pair of longitudinal channels. At least one of the cam plates has an arcuate slot configured to mate with a component of the suspension system.

[0007] In another embodiment of the invention, both the first and second cam plates have an arcuate slot. The longitudinal channels of the threaded fastener has a t-shaped cross section.

[0008] In another embodiment of the invention, the threaded fastener has a knurl portion configured to mate with the first cam bolt. Further, the channel of the cam bolt assembly defines a pair of exterior bearing surfaces which mate with a corresponding interior bearing surface within the aperture.

[0009] Further areas of applicability of the present invention will become apparent from the detailed description provided hereinafter. It should be understood that the detailed description and specific examples, while indicating the preferred embodiment of the invention, are intended for purposes of illustration only and are not intended to limit the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The present invention will become more fully understood from the detailed description and the accompanying drawings, wherein:

[0011] Figure 1 represents a perspective exploded view of a cam bolt according to one embodiment of the invention;

[0012] Figure 2 represents a side view of the fastener according to the teachings of the present invention;

[0013] Figure 3 is an end view of the fastener according to the teachings of the present invention;

[0014] Figure 4 is a perspective assembled view of the retaining bolt;

[0015] Figure 5 is a perspective view of the threaded bolt ;

[0016] Figure 6 is a side view of the threaded bolt shown in Figure 5; and

[0017] Figure 7 is a cross sectional view of the threaded bolt shown in Figure 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] The following description of the preferred embodiment is merely exemplary in nature and is in no way intended to limit the invention, its application, or uses.

[0019] Figures 1 and 2 represent a perspective exploded view and a side view of a cam bolt assembly 10 according to the teachings of the present invention. The cam bolt assembly 10, which is formed of a threaded bolt 12, first cam plate 14, second cam plate 16, and a nut 18, is used in a vehicle's suspension system to adjust the vehicle's wheel alignment. When assembled, the cam bolt assembly is configured to have a rotational tolerance of ± 3 degrees.

[0020] The threaded bolt 12 has a bolt head 20 having a bolt head inner surface 22 which supports the first cam plate 14. The first cam plate 14 defines a circular aperture 24, which has a radius substantially equal to the diameter of the threaded bolt 12. The first cam plate 14 is rotationally coupled to the threaded bolt 12 by a knurl 26 formed on the threaded bolt 12 adjacent the bolt head 20. In this regard, the circular aperture 24 is configured to have a diameter such that the coupling of the circular aperture with the knurl 26 rotationally and longitudinally fixes the first cam plate 14 to the bolt 12.

[0021] As best seen in Figure 2, the second cam plate 16 has an aperture 28 which is configured to mate with the cross section 30 of the threaded portion of the threaded bolt 12. The second cam plate 16 is disposed about the

threaded bolt 12 so that the first and second cam plates 14 and 16 are generally parallel.

[0022] Figure 3 is an end view of the cam bolt assembly 10 according to the teachings of the present invention. Each cam plate 14 and 16 defines a generally arcuate slot 34. The arcuate slots 34 are used to adjustably couple portions of the vehicle's suspension system. The position of the suspension components (not shown) mounted to the cam plates 14 and 16 can be adjusted by translating the suspension components within the arcuate slot 34.

[0023] Each cam plate 14 and 16 additionally defines a generally triangular periphery 32. One side of the triangle periphery 32 has an exterior surface 36 which generally conforms to the arcuate slot 34. Disposed between the exterior surface 36 is a plurality of measurement marks 38 which are used to position suspension components within the arcuate slot 34. Each cam plate 14 and 16 is formed of low carbon steel and has a thickness of about 5 mm.

[0024] Figure 4 is a perspective assembled view of the cam bolt assembly 10. Shown is the second cam plate 16 disposed over a threaded portion 50 of the threaded bolt 12. Defined on the threaded portion 50 of the threaded bolt 12 is a pair of longitudinal channels 56. The pair of channels 56 can optionally extend into a shoulder portion 52 of the threaded fastener 12. The channels 56 define a generally t-shaped cross section.

[0025] Figures 5 and 6 are perspective and side views of the threaded bolt 12. Shown is the knurl portion 26 defined adjacent the head 20 on the unthreaded shoulder portion 52 of the threaded fastener 12. The knurl portion 26

is pressed into the aperture 24 of the first plate 14. While the threaded bolt 12 can be formed of 1018 steel, any suitable material can be used. Optionally, this material can be heat treated. The second cam plate 16 and the channels 56 define an interface capable of withstanding 150 nm of torque, and preferably 200nm of torque.

[0026] Figure 7 is a cross sectional view of the threaded bolt shown in Figure 5 and 6. The threaded portion 50 has a diameter 58 of between 13.75 and 14 mm. The pair of channels 56 define a first portion 58 having a thickness T of about 8.3 mm. The pair of channels 56 can be cut through a portion of a threaded portion of the threaded bolt. Additionally, it is envisioned the channels can be cut through the entire length of the threaded portion, into a non-threaded portion of the bolt. The channels 56 further define a pair of exterior bearing surfaces 59 which mate with the corresponding interior surfaces within the aperture 28. The second portion 60 has a height H of about 8.0 mm. Each channel has an inner radius R of about 2.0 mm. Each channel 56 cuts through the threads 62 of the threaded portion into the central core portion 64 of the cross section 30. Preferably, the bolt will have a bolt strength class rating of 8.8 to 10.9 and greater. The previously mentioned specific dimensions disclosed herein have been found to allow the cam bolt assembly 10 to maintain a strength class 10.9 rating, while maintaining the torsional stability needed in suspension components.

[0027] The description of the invention is merely exemplary in nature and, thus, variations that do not depart from the gist of the invention are intended

to be within the scope of the invention. Specifically, the measurements are provided for a specific diameter bolt. As such, the various measurements can be used are exemplary and can be used as ratios to form cam bolts having larger or small diameter threaded bolt. Such variations are not to be regarded as a departure from the spirit and scope of the invention.